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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/670,000	09/25/2000	James M. Holden	M-9455 US	3656

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SKJERVEN MORRILL LLP
25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110

EXAMINER

KAO, CHIH CHENG G

ART UNIT	PAPER NUMBER
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2882

DATE MAILED: 09/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/670,000

Applicant(s)

HOLDEN ET AL.

Examiner

Chih-Cheng Glen Kao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 1,2,17-26 and 29 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7 and 8 is/are allowed.
- 6) ☒ Claim(s) 3-6,9-16,27 and 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11-13.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Although proposed drawings were mentioned in the Amendment filed June 13, 2002, no proposed drawings were enclosed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 3, 5, 9, 10, 13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al. (US Patent 5,596,406) in view of Ledger (US Patent 5,555,474), Lochbihler et al. ("Characterization of highly conducting wire gratings using an electromagnetic theory of diffraction"), and Raymond et al. ("Resist and etched line profile characterization using scatterometry").

Rosencwaig et al. shows an apparatus (Fig. 2) and method comprising: a radiation source emitting broadband radiation (Fig. 2, #32), a rotating polarizing element with radiation passing through a polarizing element toward a sample (Fig. 2, #122), at least one of a polarizing element and sample rotatable (col. 10, lines 7-20), reflected radiation passing through a rotating polarizing element (col. 2, #132), and a spectrograph with a dispersing element (col. 7, lines 38-44) that

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detects the intensity at a plurality of polarization orientations (Fig. 2, #64, and col. 9, lines 31-35). The method is repeated when the apparatus is used again.

However, Rosencwaig et al. does not seem to specifically disclose reflected radiation passing through the said polarizing element, a computer system with at least one computer and program executed to extract spectral information, an optical model, and curve fitting calculated spectral information to extracted spectral information to acceptability, and a reference database for comparison.

Ledger shows a processor to extract spectral information (Fig. 1, #28a) and a reference database for comparison (Fig. 2, "E"). The Examiner takes Official Notice that a processor is conventionally used for computer systems with at least one computer and program.

Lochbihler et al. teaches and curve fitting calculated spectral information to extracted spectral information (Fig. 7) to acceptability (Page 236, "best fit") .

Raymond et al. teaches an optical model (Page 480, second paragraph).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have a computer system to extra spectral information of Ledger with the suggested apparatus of Rosencwaig et al., which is explained with motivation as follows. One would be motivated to have a processor to extract spectral information to process information for optical models (Fig. 5a and 5b) to easily identify diffracting structures in a sample. One would be motivated to use a computer system with at least one computer and program for a user-friendly system to analyze data and have user interfaces.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to generate a reference database for comparison with the suggested method

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of Rosencwaig et al., since one would be motivated obtain a best fit curve in a conventional computation flow (col. 8, lines 66-67, to col. 9, lines 1-134) to obtain a best fit image according to the acquired information.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have best fitting of Lochbihler et al. with the suggested apparatus of Rosencwaig et al., since one would be motivated to compare the measurements to standards and insure the proper parameters as implied from Lochbihler et al. (Page 236, 3.2 Comparison to measurements, first 3 paragraphs).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the optical model of Raymond et al. with the suggested apparatus of Rosencwaig et al., since one would be motivated to check the measurement results of a sample set with a standard to check for good edge acuity as shown by Raymond et al. (Page 480, second paragraph).

Lastly, it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the reflected radiation passing through the said polarizing element with the device of Rosencwaig et al., which is explained with motivation as follows. To have the reflected radiation pass through the said polarizing element, one having only routine skill in the art would have found it obvious to form in one piece an article, which has formerly been formed in two pieces and put together. One would be motivated to integrate the polarizers together to save space and make the device smaller for convenience. Secondly, with regards to the diffracted structure, the functional recitation with respect to the manner in which a claimed

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apparatus is intended to be employed does not differentiate the claimed apparatus from an obvious modification of a prior art apparatus satisfying the claimed structural limitations.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al. as applied to claim 3 above, and further in view of Green et al. (US Patent 5956145).

Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al. suggests a device as recited above.

However, Rosencwaig et al. does not seem to specifically disclose non-linear regression.

Green et al. teaches non-linear regression (col. 38, lines 20-42).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have non-linear regression of Green et al. with the suggested device of Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al., since it is considered conventional as the most commonly used regression technique as shown by Green et al. (col. 38, lines 27-30). One would be motivated to use non-linear regression to evaluate the parameters of the sample in tests as shown by Green et al. (col. 38, lines 8-15 and 20-25).

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al. as applied to claim 3 above, and further in view of Naqvi et al. ("Scatterometry and the Simulation of Diffraction-Based Metrology").

Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al. suggests a device as recited above.

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However, Rosencwaig et al. does not seem to specifically disclose rigorous couple-wave analysis.

Naqvi et al. teaches disclose rigorous couple-wave analysis (Page 6, col. 1, last paragraph).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have rigorous couple-wave analysis of Naqvi et al. with the suggested device of Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al., since it is it has proved particularly useful for gratings having a continuously varying refractive index as shown by Naqvi et al. (Page 6, col. 2, third paragraph).

5. Claims 11, 12, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuni et al. (US Patent 4647196) in view of Rosencwaig et al. (US Patent 5,596,406).

Kuni et al. discloses an apparatus comprising a radiation source (Fig. 10, #61), radiation passing through a polarizing element (Fig. 10, #71), radiation normally incident off the sample (Fig. 10, #4) and passing through a polarizing element (Fig. 10, #70), and a θ -stage (col. 5, lines 34-38).

However, Kuni et al. does not seem to specifically disclose broadband radiation, reflected radiation through said rotatable polarizer, and a spectrograph that detects a plurality of polarization orientations.

Rosencwaig et al. teaches broadband radiation (Fig. 2, #32), a rotatable polarizer (col. 10, lines 7-20), and a spectrograph that detects the intensity at a plurality of polarization orientations (Fig. 2, #64, and col. 9, lines 31-35).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the broadband radiation to illuminate a spectrograph of Rosencwaig et al., with the device of Kuni et al., since one would be motivated to use this technique for simultaneous multiple angle of incidences and wavelengths for measurement in interferometric devices as suggested by Rosencwaig et al. (col. 4, lines 29-40).

Secondly, it would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the reflected radiation passing through the said polarizing element with the suggested device of Kuni et al. in view of Rosencwaig et al., which is explained with motivation as follows. To have the reflected radiation pass through the said polarizing element, one having only routine skill in the art would have found it obvious to form in one piece an article, which has formerly been formed in two pieces and put together. One would be motivated to integrate the polarizers together to save space and make the device smaller for convenience. Secondly, with regards to the diffracted structure, the functional recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from an obvious modification of a prior art apparatus satisfying the claimed structural limitations.

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al. as applied to claim 13 above, and further in view of Kuni et al.

Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al. suggests a method as recited above.

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However, Rosencwaig et al. does not seem to specifically disclose a rotating structure.

Kuni et al. teaches a rotating structure.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the rotating structure of Kuni et al., with the suggested device of Rosencwaig et al. in view of Ledger, Lochbihler et al., and Raymond et al., since one would be motivated to move the structure to actually scan for flaws as implied by Kuni et al. (Title, and col. 5, lines 34-38).

Allowable Subject Matter

7. The indicated allowability of claims 3-6, 11, 12, 16, 27, and 29 is withdrawn in view of the newly discovered reference(s). Rejections based on the newly cited reference(s) are as recited above.

Response to Arguments

8. Applicant's arguments with respect to claims 13-15 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (703) 605-5298. The examiner can normally be reached on M - Th (8 am to 5 pm).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



gk
September 9, 2002



ROBERT H. KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800